

CLMPTO

8/27/03

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CLAIMS 1-77 CANCELLED

78. A method of gathering spatial information, such method comprising the steps of:  
retrieving an oversampled delta-sigma modulated sequence for a selected set of channels of a transducer array from a memory;  
delaying the sequence of each channel of the selected set within a transmit/receive delay register to steer a transmitted ultrasonic beam;  
counting a number of samples of the delta-sigma modulated sequence to detect an end of a transmit sequence;  
detecting a reflected signal at the end of the transmit sequence on each channel of the selected set of channels;  
delta-sigma modulating the detected signal of each channel;  
dynamically delaying a corresponding set of delta-sigma modulated samples from among the channels of the modulated detected signals in the transmit/receive delay register;  
summing a corresponding set of delta-sigma modulated values to provide an output signal whose amplitude corresponds to a signal intensity of the formed beam as a function of range.
79. The method of gathering spatial information as in claim 78 wherein the step of beamforming a received signal in the transmit/receive delay register further comprises using a series of delay and addition stages in the transmit/receive delay register to partially beamform elevational and azimuthal transducer array elements.
80. The method of gathering spatial information as in claim 78 further comprising premodulating the detected reflected signal.

81. The method of gathering spatial information as in claim 78 further comprising the step of time gain compensating the detected reflected signal.
82. The method of gathering spatial information as in claim 78 further comprising the step of differentially driving a set of signal amplifiers of an ultrasonic transducer array with the oversampled delta-sigma modulated sequence.
83. The method of gathering spatial information as in claim 78 further comprising alternating a polarity of a set of transducer array elements to reduce common mode noise.
84. The method of gathering spatial information as in claim 78 further comprising remodulating a summed output of the beamformer with a delta-sigma modulator.
85. The method of gathering spatial information as in claim 78 further comprising detecting a reflected signal over a two-dimensional array.
86. The method of gathering spatial information as in claim 78 further comprising dynamically delaying the delta-sigma modulated signal using a barrel shifter.
87. The method of gathering spatial information as in claim 78 further comprising adjusting a delay period and repeating the steps of detecting, delta-sigma modulating, dynamically delaying and summing.
88. Apparatus for gathering spatial information, such apparatus comprising:
  - means for retrieving an oversampled delta-sigma modulated sequence for a selected set of channels of a transducer array from a memory;
  - means for delaying the sequence of each channel of the selected set within a transmit/receive delay register to steer a transmitted ultrasonic beam;
  - means for counting a number of samples of the delta-sigma modulated sequence to detect an end of a transmit sequence;

means for detecting a reflected signal at the end of the transmit sequence on each channel of the selected set of channels;

means for delta-sigma modulating the detected signal of each channel;

means for dynamically delaying a corresponding set of delta-sigma modulated samples from among the channels of the modulated, detected signals in the transmit/receive delay register;

means for summing a corresponding set of delta-sigma modulated values to provide an output signal whose amplitude corresponds to a signal intensity of the formed beam as a function of range.

89. The apparatus for gathering spatial information as in claim 88 wherein the means for beamforming a received signal in the transmit/receive delay register further comprises means for using a series of delay and addition stages in the transmit/receive delay register to partially beamform elevational and azimuthal transducer array elements.

90. The apparatus for gathering spatial information as in claim 88 further comprising means for premodulating the detected reflected signal.

91. The apparatus for gathering spatial information as in claim 88 further comprising means for time gain compensating the detected reflected signal.

92. The apparatus for gathering spatial information as in claim 88 further comprising means for differentially driving a set of signal amplifiers of an ultrasonic transducer array with the oversampled delta-sigma modulated sequence.

93. The apparatus for gathering spatial information as in claim 88 further comprising means for alternating a polarity of a set of transducer array elements to reduce common mode noise.

94. The apparatus for gathering spatial information as in claim 88 further comprising means for remodulating a summed output of the beamformer with a delta-sigma modulator.

95. The apparatus for gathering spatial information as in claim 88 further comprising means for detecting a reflected signal over a two-dimensional array.
96. The apparatus for gathering spatial information as in claim 88 further comprising means for dynamically delaying the delta-sigma modulated signal using a barrel shifter.
97. The apparatus for gathering spatial information as in claim 88 further comprising means for adjusting a delay period and for forming a beam in a different direction.
98. The apparatus for gathering spatial information as in claim 88 further comprising an analog multiplexer which couples the detected reflected signal between the means for detecting and the means for delta-sigma modulating.
99. The apparatus for gathering spatial information as in claim 88 further comprising a plurality of premodulators coupling between the analog multiplexer and means for delta-sigma modulating.
100. The apparatus for gathering spatial information as in claim 88 further comprising a shared analog amplification circuit which buffers the plurality of premodulators.